z/VM 620 Customer Perspective: Lots to Love and Admire (Best Release Ever!)

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VM RESOURCES LTD
Software * Consulting * Training

Thank you today!

- All my friends and colleagues at the MVMUA!

MAVM Metropolitan VM Users Association, Inc.

- Len Santalucia for sponsoring this presentation!

VICOM Infinity

- Dave Jones for reviewing!

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Abstract

In this presentation David will discuss customer perspectives on z/VM 620. Topics will be the design, implementation and usage of z/VM 620 with SSI. An exciting look at multiple clustering will be shown. The refurbished DIRMAINT and SYSTEM CONFIG will be presented in all its glory. Bonus material on using the PIPEDDR tool for bulk data transfer over TCPIP to great effect will be presented as well.

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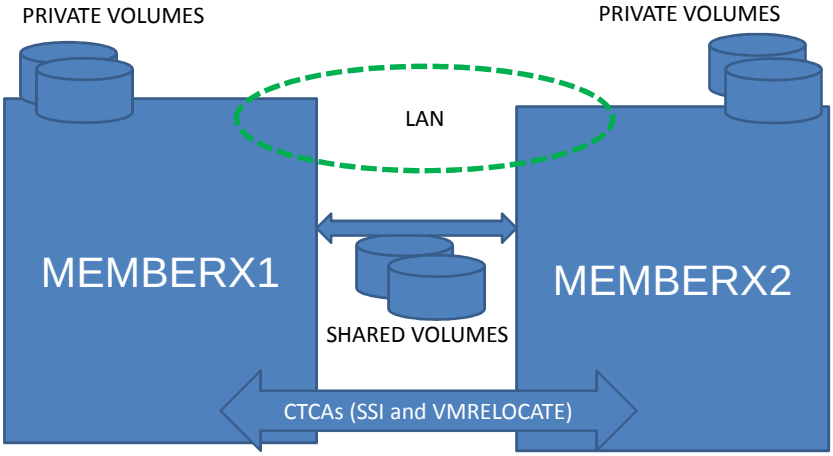
Our 2nd Level SSI Environment: Cluster CHOCOLAT



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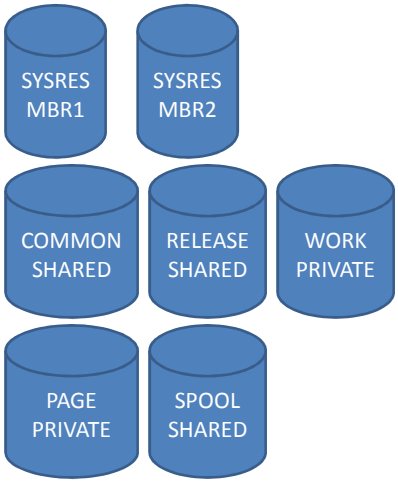
The SSI "Installation Experience"

- Even when using a single LPAR plan on an SSI implementation.
  - *Will save headaches later on*.

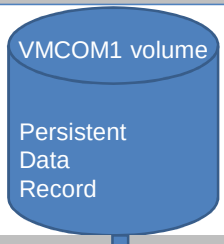
Major steps:

- Setup virtual machine
  - DVDPRIME
  - INSTPLAN
  - INSTALL
    - All the heavy lifting



Volume of Mystery: The PDR

- Persistent Data Volume
- Contains information about the state of the cluster and members



COMMON

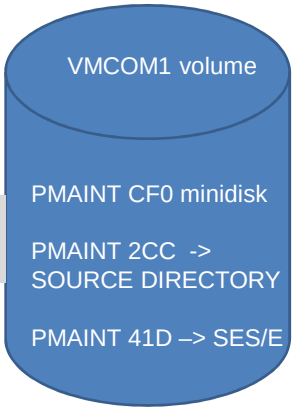
```
Q SSI
SSI Name: CHOCOLAT
SSI Mode: Stable
Cross-System Timeouts: Enabled
SSI Persistent Data Record (PDR) device: VMCOM1 on 0123
SLOT SYSTEMID STATE      PDR HEARTBEAT        RECEIVED HEARTBEAT
   1 MEMBERX1 Joined     10/10/12   20:44:32 10/10/12   20:44:32
   2 MEMBERX2 Joined     10/10/12   20:44:10 10/10/12   20:44:10
   3 -------- Available
   4 -------- Available
```

COMMON Volume

- SYSTEM CONFIG Moved to PMAINT CF0!
- SSI cluster uses a single SYSTEM CONFIG read at IPL time by all members.
- PMAINT CF0 Disappears from CP after IPL time (just LINK and ACCESS)
- 3390-03s: Two COMMON volumes

```
SYSTEM CONFIG:
System_Identifier LPAR VMRMBR01 MEMBERX1
System_Identifier LPAR VMRMBR02 MEMBERX2
```

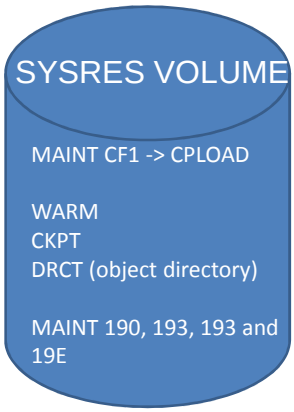
COMMON



What Remains on “SYSRES”? A lot!

- One “SYSRES” volume per MEMBER

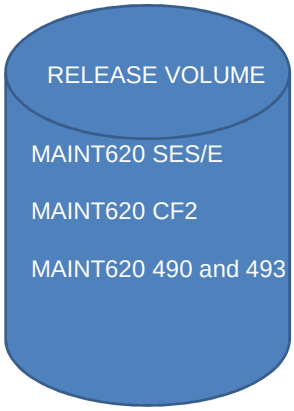
SYSRES



The RELEASE Volume

- MAINT620 minidisks
- MAINT620 CF2 PARM disk (test)
- SES/E disks
- One set per CLUSTER
- Not CPOWNED

RELEASE



Install Volumes in the CPOWNED List

```
pipe cp q cpowned
|casei locate /online/
|cons
   1  M01RES  0127  Own    Online and attached     CHOCOLAT MEMBERX1
   5  VMCOM1  0123  Own    Online and attached     CHOCOLAT --------
  10  M01S01  0129  Own    Online and attached     CHOCOLAT MEMBERX1
  11  M02S01  012A  Share  Online and attached     CHOCOLAT MEMBERX2
 253  M01P02  F003  Own    Online and attached     CHOCOLAT MEMBERX1
 255  M01P01  F000  Own    Online and attached     CHOCOLAT MEMBERX1
```

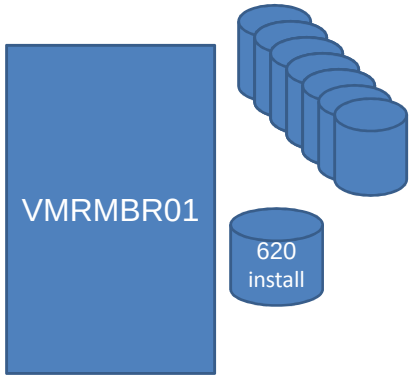
"SYSRES" = M01RES "COMMON" = VMCOM1
Local SPOOL = M01S01 Shared Spool M02S01
M01P02 and M01P01 are PAGE volumes

CHOCOLAT is the CLUSTER name,
Two MEMBERS: MEMBEX1 and MEMBERX2

Last column is the ownership assigned by CPFMTXA utility

Major Install Steps for 2nd Level

- Choose your method (DVD, FTP, or VM Minidisk)
- DVDPRIME:
  - Loads the 24CC (tools) and 2CF0 (PARMs)
- INSTPLAN
- INSTALL
- Today showing a second level SSI install with two members
  - CLUSTER name CHOCOLAT
  - Members are MEMBERX1 and MEMBERX2 in virtual machines VMRMBR01 and VMRMBR02



Installation Lessons Learned

- Pre-planning critical with 620SSI.
- Changing VOLSERs of important volumes is a pain.
- If using electronic install downloaded from IBM 1st level there are LPAR storage restrictions. Do not exceed 70Gb.
  - Use a small size (8gb) and change the LPAR memory after the install.
  - Can install from a thumb drive!
- Do not use install disks for end user minidisks.

Changed and New Utilities

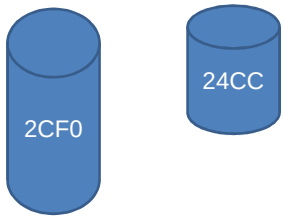
- CPFMTXA has a new option: OWNER.
  - SSI cluster name
  - Member name
- FORMSSI
  - Writes or displays the PDR
- SYSTEM CONFIG statement additions and changes

```
formssi display 789
HCPPDF6618I Persistent Data Record on device 0789 (label VMCOM1) is for
CHOCOLAT
HCPPDF6619I PDR                 state: Unlocked
HCPPDF6619I               time stamp: 10/12/12 11:21:51
HCPPDF6619I     cross-system timeouts: Enabled
HCPPDF6619I PDR slot  1        system: MEMBERX1
HCPPDF6619I                     state: Joined
HCPPDF6619I               time stamp: 10/12/12 11:21:49
HCPPDF6619I              last change: MEMBERX1
HCPPDF6619I PDR slot  2        system: MEMBERX2
HCPPDF6619I                     state: Joined
HCPPDF6619I               time stamp: 10/12/12 11:21:51
HCPPDF6619I              last change: MEMBERX2
```

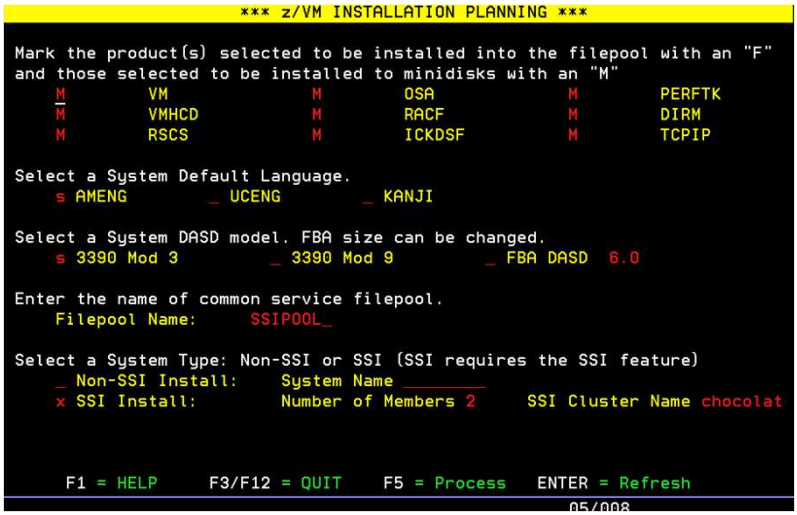

Using the VM Minidisk Install Method

dvdprime 3390 (disk

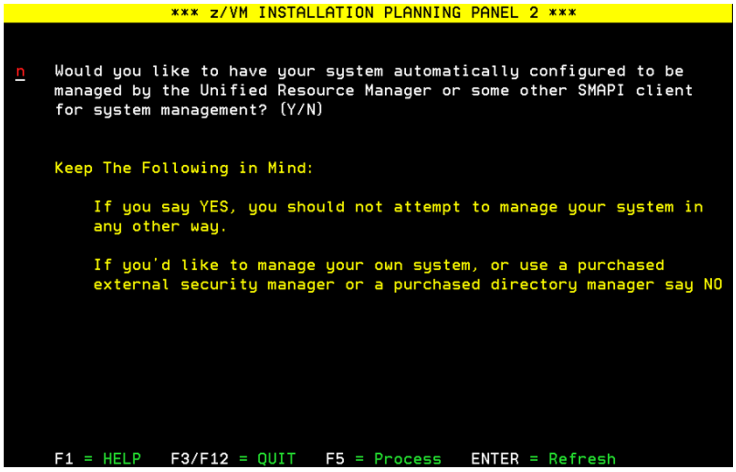
loads the 24CC and 2CF0 minidisk



INSTPLAN



No to “Point and Click” Systems Management



Choose 1st (LPAR) or 2nd (userid) Level Clustering Method

```
*** z/VM INSTALLATION PLANNING PANEL 3 ***

SSI Cluster Name:   CHOCOLAT

After installation is complete, the SSI cluster will be IPLed:

_    First-Level
s    Second-Level

SSI Member Name(s):

SLOT #     MEMBER NAME    IPL LPAR/USERID
======     ===========    ===============
  1         memberx1        vmrmbr01
  2         memberx2        vmrmbr02

      F1 = HELP   F3/F12 = QUIT   F5 = Process   ENTER = Refresh
```


Choose VOLSERs, addresses and FORMAT Decision

```
*** z/VM INSTALLATION VOLUME DEFINITION ***

      TYPE     LABEL     ADDRESS                    FORMAT (Y/N)
     =======  ========  =========                   ============
     COMMON    VMCOM1     123_                          y
     COMMON2   VMCOM2     124_
     RELVOL    620RL1     125_
     RELVOL2   620RL2     126_

      TYPE     LABEL     ADDRESS        TYPE     LABEL     ADDRESS
     =======  ========  =========      =======  ========  =========
MEMBERX1                             MEMBERX2
     RES       M01RES     127          RES       M02RES     128_
     SPOOL     M01S01     129_         SPOOL     M02S01     12a_
     PAGE      M01P01     f000         PAGE      M02P01     f001
     WORK      M01W01     12b_         WORK      M02W01     12c

      F1 = HELP      F3/F12 = QUIT      F5 = Process     ENTER = Refresh
                                                          07/019
```

INSTALL EXEC

1. CP FORMATS
2. INSTALLS More than 300 MINIDISK images
3. IPLs
4. POSTLOAD
5. BLDSEGS
6. SERVICE
7. PUT2PROD
8. SHUTREIPL
9. DDRs to other MEMBER(s): res, w01,
10. Updates config
11. IPLs other members
12. Processing on other members:
    - BLDSEG, PUT2PROD…
13. Cleanup SYSTEM CONFIG with INSTSCID

Running INSTALL and Initial Messages

```
install
HCPIIS8490I NOW FORMATTING VOLUME 0123 (1 OF 12)
HCPIIS8490I NOW FORMATTING VOLUME 0124 (2 OF 12)
HCPIIS8490I NOW FORMATTING VOLUME 0125 (3 OF 12)
:
HCPIIS8490I NOW FORMATTING VOLUME 012C (12 OF 12)

HCPIIS8490I NOW ALLOCATING DASD 0127 (RES VOLUME)
HCPIIS8490I NOW ALLOCATING DASD 0129 (SPOOLING)
HCPIIS8490I NOW ALLOCATING DASD F000 (PAGING)
HCPIIS8490I NOW ALLOCATING DASD 0128 (RES VOLUME)
HCPIIS8490I NOW ALLOCATING DASD 0128 (RES VOLUME)
HCPIIS8490I NOW ALLOCATING DASD 012A (SPOOLING)
HCPIIS8490I NOW ALLOCATING DASD F001 (PAGING)
HCPIIS8341I WRITING OWNERSHIP CHOCOLAT NOSYS TO 0123 VMCOM1 COMPLETED SUCCESSFULLY
HCPIIS8341I WRITING OWNERSHIP CHOCOLAT MEMBERX1 TO 0127 M01RES COMPLETED SUCCESSFULLY
HCPIIS8341I WRITING OWNERSHIP CHOCOLAT MEMBERX1 TO 0129 M01S01 COMPLETED SUCCESSFULLY
HCPIIS8341I WRITING OWNERSHIP CHOCOLAT MEMBERX1 TO F000 M01P01 COMPLETED SUCCESSFULLY
HCPIIS8341I CREATING PDR ON 0123 COMPLETED
```

After Loading the Minidisks INSTALL IPLs the First Member

```
*****************************************
*        NOW IPLing VOLUME 0127         *
*              WITH COMMAND:            *
*        CP SYSTEM CLEAR                *
*        TERMINAL CONMODE 3270          *
*        IPL  0127 CLEAR                *
*****************************************


 17:08:02 z/VM  V6 R2.0  SERVICE LEVEL 0000 (64-BIT)
 17:08:02 SYSTEM NUCLEUS CREATED ON 2011-10-07 AT
10:29:10, LOADED FROM M01RES
```


This is on the Install Machines 191 After INSTALL Completes

```
 PROFILE  EXEC     A1  F 80  Trunc=80 Size=12 Line=0 Col=1 Alt=0

00000 * * * Top of File * * *
00001 /* VMRMBR01 PROFILE EXEC */
00002
00003 "SPOOL CONS * START"
00004 "SET PF12 RETRIEVE"
00005 "SYNONYM SYN SYNONYM"
00006
00007 'DEFINE CTCA A2B1'
00008 'DEFINE CTCA A2B2'
00009 'COUPLE A2B1 TO VMRMBR02 B2A1'
00010 'COUPLE A2B2 TO VMRMBR02 B2A2'
00011 'EXEC DOPAGE'
00012 Exit
00013 * * * End of File * * *
```

Installation Completion

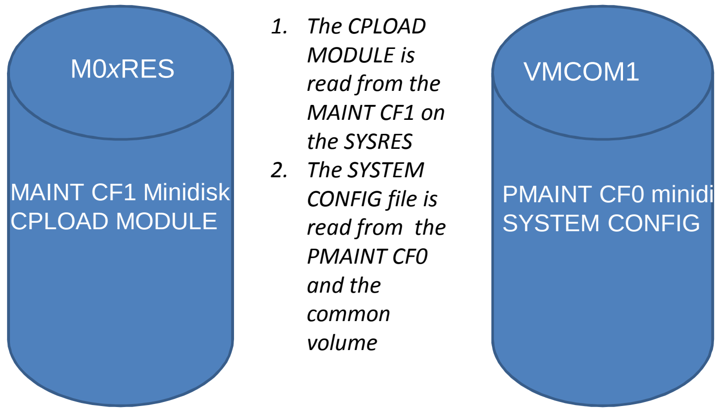
- Manually run INSTSCID to clean up SYSTEM CONFIG files within new system
- SHUTDOWN
- IPL and commence tailoring

The “IPL Experience”

- New messages about CLUSTER and MEMBERs at IPL time.
- Since CPLOAD MODULE and the SYSTEM CONFIG are on separate volumes the SAPL screen has PARMs specified.

```
IPL raddr CLEAR LOADPARM conaddr
```

IPLing MEMBERX2
IPL 128 CLEAR LOADPARM 0020



1. *The CPLOAD MODULE is read from the MAINT CF1 on the SYSRES*
2. *The SYSTEM CONFIG file is read from the PMAINT CF0 and the common volume*

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MEMBERX2: IPL 128 CLEAR LOADPARM 0020

```
STAND ALONE PROGRAM LOADER: z/VM VERSION 6 RELEASE 2.0

DEVICE NUMBER:     0128       MINIDISK OFFSET:    39         EXTENT:   1

MODULE NAME:       CPLOAD     LOAD ORIGIN:        1000

--------------------------------IPL PARAMETERS-----------------------
fn=SYSTEM ft=CONFIG pdnum=1 pdvol=0123

-----------------------------------COM                          -----

---------------------------------------------------------------------

9= FILELIST  10= LOAD  11= TOGGLE EXTENT/OFFSET
```

COMMON VOLUME ADDRESS, VOLSER VMCOM1 *(same as MEMBERX1)*

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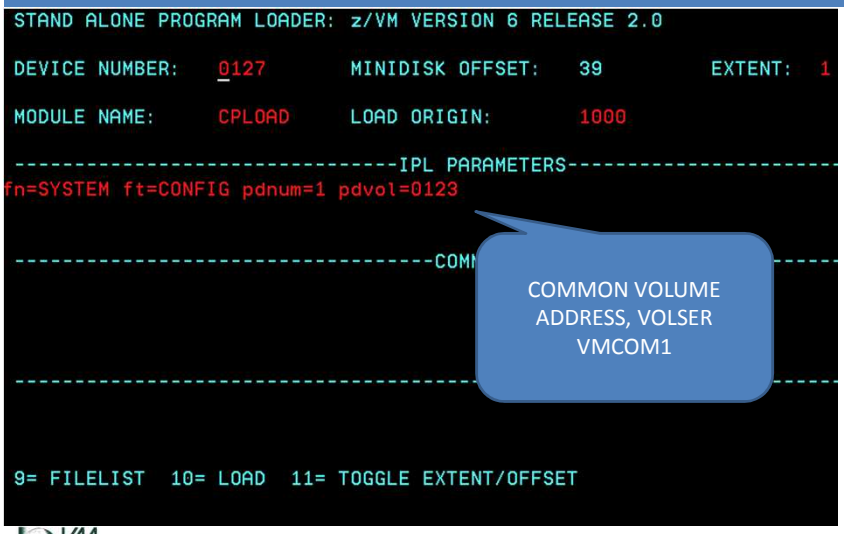
MEMBERX1: IPL 127 CLEAR LOADPARM 0020



At IPL Time The CLUSTER is Formed and the Other MEMBERs are Investigated

```
system.
he directory on volume MO1RES at address 0127 has been brought online.
HCPWRS2513I
HCPWRS2513I Spool files available      145
HCPWRS2512I Spooling initialization is complete.
ASD 0129 dump unit CP IPL pages 12734
CPAAU2700I System gateway MEMBERX1 identified.
CPPLM1644I The following is the current status of the SSI member
CPPLM1644I systems according to the PDR:
SI Name: CHOCOLAT
SI Persistent Data Record (PDR) device: VMCOM1 on 0123
LOT SYSTEMID STATE      CONNECT TYPE          HOPS
  1 MEMBERX1 Down       Local                   -
  2 MEMBERX2 Joined     Not connected           -
  3 -------- Available
  4 -------- Available
CPPLM1669I Waiting for ISFC connectivity in order to join the SSI clus

CPFCA2706I Link MEMBERX2 activated by user SYSTEM.
CPKCL2714I Link device A2B1 added to link MEMBERX2.
CPKCL2714I Link device A2B2 added to link MEMBERX2.
CPALN2702I Link MEMBERX2 came up.
                                                    MORE...    MEMBERX1
```

SSI Information at IPL TIME

```
18:06:19 HCPACQ2704I Node MEMBERX2 added to collection.
18:06:19 HCPPLM1697I The state of SSI system MEMBERX1 has changed from DOWN to J
OINING
18:06:19 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:06:19 HCPXHC1147I Spool synchronization with member MEMBERX2 initiated.
18:06:19 HCPPLM1697I The state of SSI system MEMBERX1 has changed from JOINING t
o JOINED
18:06:19 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:06:19 HCPXHC1147I Spool synchronization with member MEMBERX2 completed.
18:06:19 HCPNET3010I Virtual machine network device configuration changes are pe
rmitted
```


The QUERY SSI Command

```
query ssi
SSI Name: CHOCOLAT
SSI Mode: Stable
Cross-System Timeouts: Enabled
SSI Persistent Data Record (PDR) device: VMCOM1 on 0123
SLOT SYSTEMID STATE     PDR HEARTBEAT       RECEIVED HEARTBEAT
   1 MEMBERX1 Joined    10/11/12   18:11:47 10/11/12   18:11:47
   2 MEMBERX2 Joined    10/11/12   18:11:41 10/11/12   18:11:41
   3 -------- Available
   4 -------- Available
```

The CLUSTER CHOCOLAT has two members, MEMBERX1 and MEMBERX2 and both are up, running and communicating. Message exchange is in the PDR housed in the COMMON volume.

The “SHUTDOWN Moment”

- New Messages at SHUTDOWN when MEMBER leaves the SSI Cluster
- MEMBERX2 is SHUTDOWN and these messages are on OPERATOR on MEMBERX1:

```
18:26:23 HCPPLM1697I The state of SSI system MEMBERX2 has changed from
JOINED to  LEAVING
18:26:23 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:26:23 HCPPLM1697I The state of SSI system MEMBERX2 has changed from
LEAVING to DOWN
18:26:23 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:26:23 HCPPLM1698I The mode of the SSI cluster is STABLE
18:26:23 HCPKDM2712I Link device A2B1 was stopped by the remote node.
18:26:23 HCPKDM2712I It was deactivated from the link.
18:26:23 HCPKDM2712I Link device A2B2 was stopped by the remote node.
18:26:23 HCPKDM2712I It was deactivated from the link.
18:26:23 HCPALN2701I Link MEMBERX2 went down.
18:26:23 HCPKDM2716I Link device A2B1 is stopped.
18:26:23 HCPKCB2715I Link device A2B1 removed from link MEMBERX2.
18:26:23 HCPKDM2716I Link device A2B2 is stopped.
18:26:23 HCPKCB2715I Link device A2B2 removed from link MEMBERX2.
18:26:23 HCPFDL2706I Link MEMBERX2 deactivated by user SYSTEM.
18:26:23 HCPKCB2703I Node MEMBERX2 deleted from collection.
```


The “join Moment”

- When a MEMBER join new messages appear.
- MEMBERX2 is reIPLed and these messages appear at OPERATOR of MEMBERX1:

```
18:29:45 HCPFCA2706I Link MEMBERX2 activated by user SYSTEM.
18:29:45 HCPKCL2714I Link device A2B1 added to link MEMBERX2.
18:29:45 HCPKCL2714I Link device A2B2 added to link MEMBERX2.
18:29:46 HCPALN2702I Link MEMBERX2 came up.
18:29:46 HCPACQ2704I Node MEMBERX2 added to collection.
18:29:46 HCPPLM1697I The state of SSI system MEMBERX2 has changed from DOWN
to J
OINING
18:29:46 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:29:46 HCPPLM1697I The state of SSI system MEMBERX2 has changed from
JOINING t
o JOINED
18:29:46 HCPPLM1698I The mode of the SSI cluster is IN-FLUX
18:29:46 HCPXHC1147I Spool synchronization with member MEMBERX2 initiated.
18:29:46 HCPXHC1147I Spool synchronization with member MEMBERX2 completed.
18:29:46 HCPPLM1698I The mode of the SSI cluster is STABLE
```

SYSTEM CONFIG

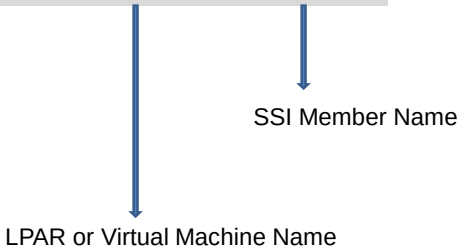
- Housed on PMAINT CF0
- Always run CPSYNTAX
  - New options on CPSYNTAX
- Extensive use of Record Qualifiers
- New Statements

Member Identification and Record Qualifiers

```
System_Identifier LPAR VMRMBR01 MEMBERX1
System_Identifier LPAR VMRMBR02 MEMBERX2

SSI CHOCOLAT  PDR_VOLUME VMCOM1,
      SLOT 1 MEMBERX1,
      SLOT 2 MEMBERX2

MEMBERX1:    System_Residence,
             Checkpoint  Volid M01RES   From CYL 21  For 9 ,
             Warmstart   Volid M01RES   From CYL 30  For 9
MEMBERX2:    System_Residence,
             Checkpoint  Volid M02RES   From CYL 21  For 9 ,
             Warmstart   Volid M02RES   From CYL 30  For 9
```

Member Identification and Record Qualifiers

```
System_Identifier LPAR VMRMBR01 MEMBERX1
System_Identifier LPAR VMRMBR02 MEMBERX2
```



Member Identification and Record Qualifiers

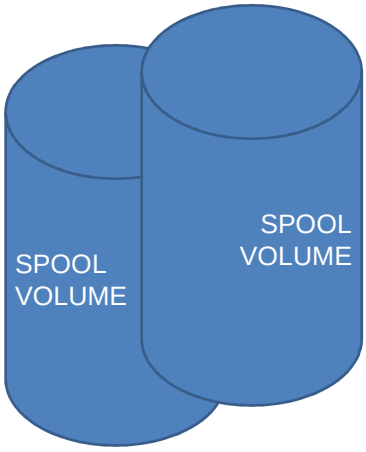
```
System_Identifier LPAR VMRMBR01 MEMBERX1
System_Identifier LPAR VMRMBR02 MEMBERX2

MEMBERX1:   BEGIN
            CP_Owned   Slot 254  M01P01
            CP_Owned   Slot 255  M01P02
MEMBERX1:   END

MEMBERX2:   BEGIN
            CP_Owned   Slot 254  M02P01
            CP_Owned   Slot 255  M02P02
MEMBERX2:   END
```

Qualified sections with “BEGIN” and “END”

Spooling Usage

Single Configuration User sees the same spool from any MEMBER logged onto.

Multiple Configuration Users see only their spool files on the MEMBER logged onto. Use other means to transfer spool files between members (FTP, RSCS, shared disks)



Where it's "AT"

- New CP Command
- Issues command on another member
- Privilege classes applies
- Restrictions on certain commands
- Plays nicely especially with synchronous command

```
AT <member> CMD <command string>
```

AT Issued from MAINT at MEMBERX2

```
q privclass
Privilege classes for user MAINT
        Currently: ABCDEFG
        Directory: ABCDEFG
Ready; T=0.01/0.01 09:11:22
at memberx1 cmd q srm
IABIAS : INTENSITY=90%; DURATION=2
LDUBUF : Q1=100% Q2=75% Q3=60%
STORBUF: Q1=300% Q2=250% Q3=200%
DSPBUF : Q1=32767 Q2=32767 Q3=32767
DISPATCHING MINOR TIMESLICE = 5 MS
MAXWSS : LIMIT=9999%
...... : PAGES=999999
XSTORE : 0%
LIMITHARD METHOD: CONSUMPTION
Ready; T=0.01/0.01 09:11:38
```

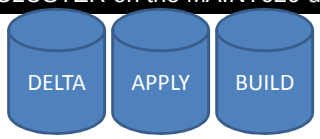
More Where It's AT

```
at memberx1 cmd set srm storbuf 300 300 300
STORBUF: Q1=300% Q2=300% Q3=300%

pipe cp at memberx1 cmd q srm
|locate /STORBUF/
| insert /MEMBERX1: /
|Console
MEMBERX1: STORBUF: Q1=300% Q2=300% Q3=300%

pipe cp q srm
|locate /STORBUF/
| insert /MEMBERX2: /
|Console
MEMBERX2: STORBUF: Q1=300% Q2=250% Q3=200%
```

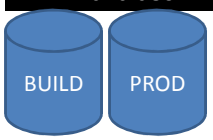
The SSI "Service Experience"

- SERVICE and PUT2PROD are your friends
  - progress makes strange bedfellows
- Must run SERVICE from the MAINT620 userid.
  - From any member of the cluster
  - Logged on only on one member
    - CP will prevent dual member logon of MAINT620
- PUT2PROD must be run from MAINT620 on EACH member

SERVICE from any MEMBER in CLUSTER on the MAINT620 user

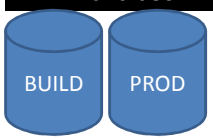


PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user



MEMBERX2

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user



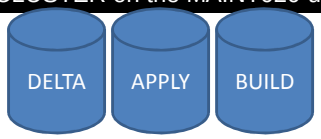
MEMBERX1

BEFORE the SERVICE run from ANY MEMBER

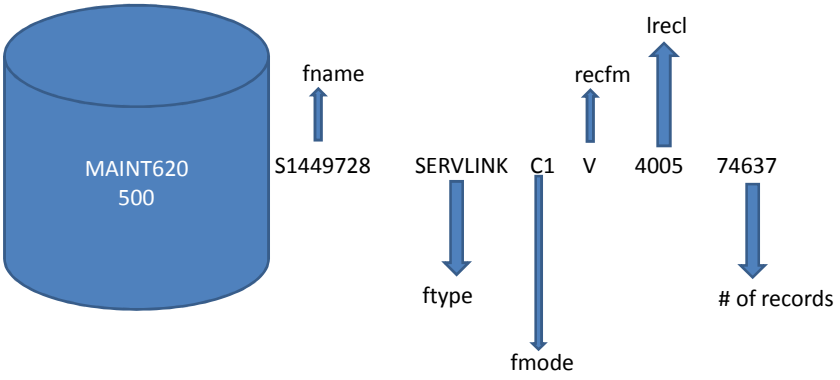
```
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional
options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level      RSU-1101
VMFSRV1225I    Production Level   MEMBERX1.RSU-1101
VMFSRV1225I                       MEMBERX2.RSU-1101
VMFSRV2760I SERVICE processing completed successfully
Ready; T=0.17/0.19 10:34:00
```

BEFORE

SERVICE from any MEMBER in CLUSTER on the MAINT620 user



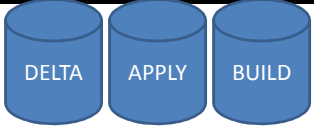
The RSU File is on MAINT620's 500 Minidisk



MEMBERX1 MAINT620: service all s1449728

```
You are viewing ¬ST: messages from the LAST run.
Number of messages shown = 7 <===> Number of messages not shown = 764
*************************************************************************
****              SERVICE              USERID: MAINT620              ****
*************************************************************************
****            Date: 10/11/12           Time: 10:36:42              ****
*************************************************************************
CK: VMFSUI2104I PTF UM33449 contains user information. Review the :UMEMO
CK:             section in file UM33449 $PTFPART
WN: VMFBDC2250W The following VMHCD objects have been built on BUILD0 300
WN:              (I) and should be copied to your workstation:
WN: VMFBDC2250W EEQINSTM MSIBIN
WN: VMFBDC2250W The following OSA objects have been built on BUILD0 100
WN:              (K) and should be copied to your workstation:
WN: VMFBDC2250W IOAJAVA  BIN
CK: VMFSRV1233I The following products have been serviced.
CK: VMFSRV1233I CMS CP OSA TCPIP VMHCD
* * * End of File * * *
```

SERVICE from any MEMBER in CLUSTER on the MAINT620 user

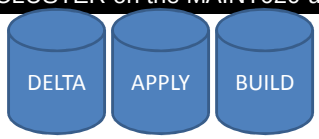


MEMBERX1 MAINT620 AFTER SERVICE only the service level is changed

```
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level      RSU-1201
VMFSRV1225I    Production Level   MEMBERX1.RSU-1101
VMFSRV1225I                       MEMBERX2.RSU-1101
VMFSRV2760I SERVICE processing completed successfully
Ready; T=0.13/0.15 10:42:02
```

AFTER SERVICE

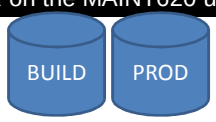
SERVICE from any MEMBER in CLUSTER on the MAINT620 user



PUT2PROD Run on MEMBERX1 from MAINT620

```
===> VMFVIEW - Message Log Browse of $VMFP2P  $MSGLOG  A1 <===
You are viewing ¬ST: messages from the LAST run.
Number of messages shown = 4 <===> Number of messages not shown = 207
*******************************************************************************
****      PUT2PROD      SYSTEM: MEMBERX1      USERID: MAINT620      ****
*******************************************************************************
****           Date: 10/11/12           Time: 10:46:53           ****
*******************************************************************************
CK:VMFP2P1233I The following products have been put into production.
CK:            Recycle the appropriate servers.
CK:VMFP2P1233I CMS CP OSA TCPIP VMHCD
CK:VMFP2P1239I CP was serviced. Shutdown and re-IPL the system to employ
CK:            the new service.
```

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user

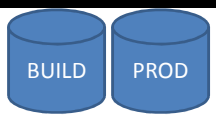


MEMBERX1

MEMBER1 MAINT620 After PUT2PROD

```
q cplevel
z/VM Version 6 Release 2.0, service level 1101 (64-bit)
Generated at 11/02/11 18:54:31 EDT
IPL at 10/11/12 09:40:45 EDT
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level     RSU-1201
VMFSRV1225I    Production Level  MEMBERX2.RSU-1101   BEFORE PUT2PROD
VMFSRV1225I                      MEMBERX1.RSU-1201   AFTER PUT2PROD
VMFSRV2760I SERVICE processing completed successfully
```

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user

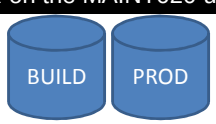


MEMBERX1

MEMBERX2 MAINT620 Before PUT2PROD

```
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional
options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level     RSU-1201   BEFORE PUT2PROD
VMFSRV1225I    Production Level  MEMBERX2.RSU-1101
VMFSRV1225I                      MEMBERX1.RSU-1201
VMFSRV2760I SERVICE processing completed
```

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user



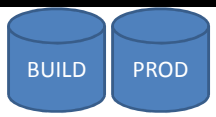
MEMBERX2

MEMBERX2 MAINT620After PUT2PROD

```
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional
options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level     RSU-1201
VMFSRV1225I    Production Level  MEMBERX1.RSU-1201
VMFSRV1225I                      MEMBERX2.RSU-1201
VMFSRV2760I SERVICE processing completed successfully
```

AFTER PUT2PROD

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user

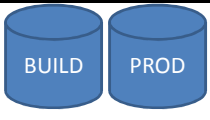


MEMBERX2

MEMBERX1 MAINT620 After PUT2PROD on MEMBERX2

```
service cp status
VMFUTL2767I Reading VMFINS DEFAULTS B for additional
options
VMFSRV2195I SERVICE CP STATUS
VMFSRV2760I SERVICE processing started
VMFSRV1225I CP (6VMCPR20%CP) status:
VMFSRV1225I    Service Level     RSU-1201
VMFSRV1225I    Production Level  MEMBERX1.RSU-1201
VMFSRV1225I                      MEMBERX2.RSU-1201
VMFSRV2760I SERVICE processing completed successfully.
```

PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user

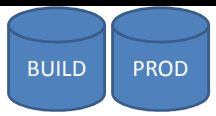


MEMBERX1 and MEMBERX2

QUERY CPLEVEL on Both MEMBERS Report New RSU Level

```
at *        cmd q cplevel
z/VM Version 6 Release 2.0, service level 1201 (64-bit)
Generated at 04/16/12 15:12:31 EDT
IPL at 10/11/12 14:00:40 EDT

at memberx2 cmd q cplevel
z/VM Version 6 Release 2.0, service level 1201 (64-bit)
Generated at 04/16/12 15:12:31 EDT
IPL at 10/11/12 14:41:34 EDT
```

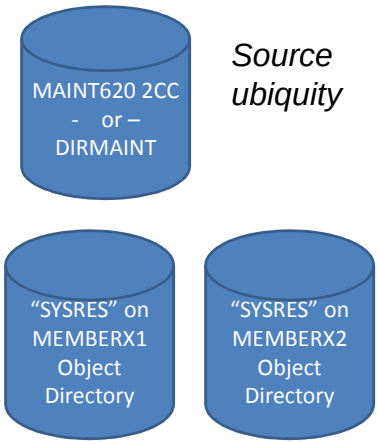
PUT2PROD from EVERY MEMBER in CLUSTER on the MAINT620 user



MEMBERX1 and MEMBERX2

DIRECTORY Experience

- Shared source directory. One copy of source directory.
  - MAINT620 2CC
  - Or, better yet, DIRMAINT managed.
- Object directory same on each member within a cluster



Source ubiquity

USER or IDENTITY Entries

- USER entry connotes:
  - Heritage type virtual machine
  - Logon any member
  - Logged onto one member
  - Examples: DIRMAINT, MAINT620, Linux machines for relocation benefit
- IDENTITY entry connotes:
  - New type directory entry
  - Logon any member
  - Simultaneous logons allowed
  - Examples: TCPMAINT, AUTOLOG1

```
USER MAINT620 MAINT620  256M 1000M ABCDEF
 AUTOLOG AUTOLOG1 OP1 MAINT
 ACCOUNT 1 SYSPROG
 MACH ESA
```

```
IDENTITY MAINT MAINT 256M 1000M ABCDEFG
   BUILD ON MEMBERX1 USING SUBCONFIG MAINT-1
   BUILD ON MEMBERX2 USING SUBCONFIG MAINT-2
```


IDENTITY Entries

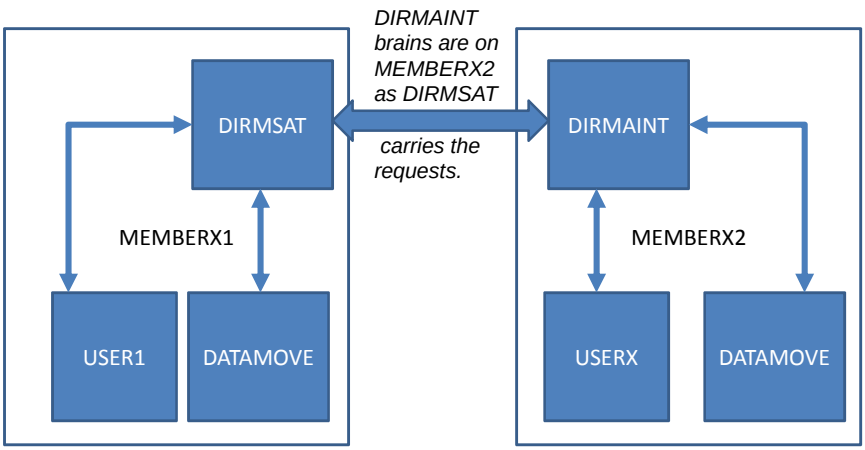
- Multiple Configuration Entry
  - Used in an SSI cluster
- Contains BUILD and SUBCONFIG entry
- Logon to MEMBERs listed in BUILD statements
  - concurrently
  - If no BUILD statements can logon to any MEMBER

IDENTITY TCPMAINT

```
IDENTITY TCPMAINT TCPMAINT   32M   64M ABCG
 INCLUDE TCPCMSU
 BUILD ON MEMBERX1 USING SUBCONFIG TCPMNT-1
 BUILD ON MEMBERX2 USING SUBCONFIG
SUBCONFIG TCPMNT-1
 LINK 6VMTCP20 491 491 RR
 LINK 6VMTCP20 492 492 RR
 MDISK 591 3390 2349 122 M01W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
 MDISK 592 3390 2471 140 M01W01 MR ALL      WTCPMAIN MTCPMAIN
 MDISK 198 3390 2611 009 M01W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
 MDISK 191 3390 2620 007 M01W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
SUBCONFIG TCPMNT-2
 LINK 6VMTCP20 491 491 RR
 LINK 6VMTCP20 492 492 RR
 MDISK 591 3390 2349 122 M02W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
 MDISK 592 3390 2471 140 M02W01 MR ALL      WTCPMAIN MTCPMAIN
 MDISK 198 3390 2611 009 M02W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
 MDISK 191 3390 2620 007 M02W01 MR RTCPMAIN WTCPMAIN MTCPMAIN
```

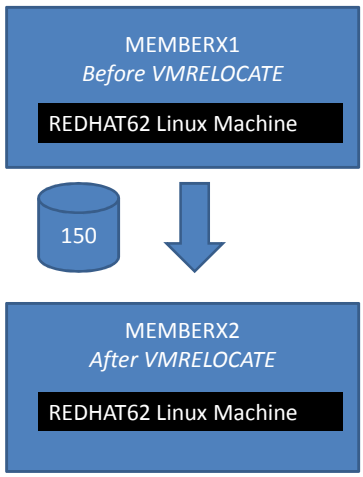
TCPMAINT may logon to MEMBERX1 and MEMBERX2. SUBCONFIG TCPMNT-1 is used when logging onto MEMBERX1 while SUBCONFIG TCPMNT-2 is used on MEMBERX2.

DIRMAINT Design



The Payoff: Virtual Machine Relocation

- Live Guest Relocation is glorious
- Many conditions must be met on source and target cluster members including:
  - Sufficient memory and paging bandwidth on target
  - EQID on network devices (Equivalency IDs)
  - CMS minidisks are a nuisance mostly, detach before the move.
- Define same VSWITCH name on all members
- Seamless move, applications stay alive!



The REDHAT62 Directory Entry

- Single Configuration Userid
- 150 Disk with the root filesystem

```
USER REDHAT62 VMRULES 512M 12G G
   IPL 150 LOADPARM 0
   MACHINE XA
   OPTION CHPIDV ONE
   CONSOLE 0009 3215 T DAVE
   NICDEF 0600 TYPE QDIO LAN SYSTEM CLUSTNET
   SPOOL 000C 2540 READER *
   SPOOL 000D 2540 PUNCH A
   SPOOL 000E 1403 A
   MDISK 0150 3390 0 4999 0X0150 MR REDHAT62
```

Simulate CHPID and DASD path virtualization

VSWITCH

/boot -> part 1
/ -> part 2

MEMBERX1 REDHAT62 Relocation test

```
vmrelocate test user redhat62 to memberx2
User REDHAT62 is eligible for relocation to MEMBERX2
Ready; T=0.01/0.01 14:46:44

q vswitch
VSWITCH SYSTEM CLUSTNET Type: QDIO    Connected:
  VLAN Unaware
  MAC address: 02-00-01-00-00-05     MAC Protection: OFF
  State: Ready
  IPTimeout: 5         QueueStorage: 8
  Isolation Status: OFF
 Uplink Port:
  RDEV: E000.P00 VDEV: 0600 Controller: DTCVSW2
        EQID: ABCDEFGH
```

Matches names on VSWITCHes on other MEMBERs

Unique MACID for VSWITCH

Matches names on OSAs on other members

MEMBERX1 REDHAT62

```
q vswitch user redhat62
;
Adapter Connections:
    Adapter Owner: REDHAT62 NIC: 0600.P00 Name: UNASSIGNED  Type:
QDIO
      RX Packets: 19         Discarded: 0          Errors: 0
      TX Packets: 8          Discarded: 0          Errors: 6
      RX Bytes: 3815                TX Bytes: 636
      Device: 0602  Unit: 002   Role: DATA       Port: 0001
      Options: Broadcast Multicast IPv6 IPv4 VLAN
        Unicast IP Addresses:
          10.100.0.103  IP      MAC: 02-00-01-00-00-06  MACID
          FE80::200:100:100:6  MAC: 02-00-01-00-00-06 Local
        Multicast IP Addresses:
          224.0.0.1            MAC: 01-00-5E-00-00-01
          FF02::1              MAC: 33-33-00-00-00-01 Local
          FF02::1:FF00:6       MAC: 33-33-FF-00-00-06 Local
```

MEMBERX2 VSWITCH before relocation of REDHAT62

Matches names on VSWITCHes on other MEMBERs

```
q vswitch
VSWITCH SYSTEM CLUSTNET Type: QDIO    Connected: 0    Maxconn:
INFINITE
  PERSISTENT  RESTRICTED    NONROUTER            Accounting: OFF
  USERBASED
  VLAN Unaware
  MAC address: 02-00-02-00-00-03    MAC Protection: OFF
  State: Ready
  IPTimeout: 5         QueueStorage: 8
  Isolation Status: OFF
 Uplink Port:
  RDEV: E000.P00 VDEV: 0600 Controller: DTCVSW1
        EQID: ABCDEFGH
```

Unique MACID for VSWITCH

Matches names on OSAs on other members

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The network session before the VMRELOCATE

```
[root@rhel62 ~]#
[root@rhel62 ~]#
[root@rhel62 ~]#
[root@rhel62 ~]#
[root@rhel62 ~]#
[root@rhel62 ~]# echo before relocation
before relocation
[root@rhel62 ~]#
```

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Ka-Ching: The Relocate Pays Off!

```
14:51:09 vmrelocate move user redhat62 to memberx2
14:51:09 Relocation of REDHAT62 from MEMBERX1 to MEMBERX2
started
14:51:11 User REDHAT62 has been relocated from MEMBERX1
to MEMBERX2
14:51:11 Ready; T=0.01/0.01 14:51:11
```

Notice that it took 2 Seconds

send cp redhat62 q userid

REDHAT62: REDHAT62 AT MEMBERX2

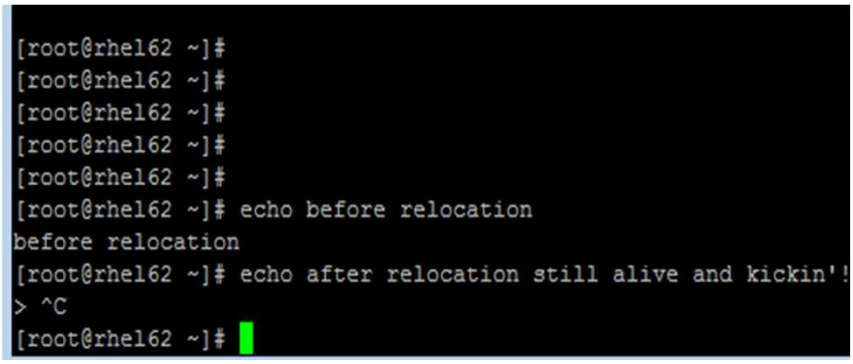
```
q vswitch user redhat62
VSWITCH SYSTEM CLUSTNET Type: QDIO    Connected: 1    Maxconn: INFINITE
  :
  MAC address: 02-00-02-00-00-03    MAC Protection: OFF
  State: Ready
  IPTimeout: 5         QueueStorage: 8
  Isolation Status: OFF
 Uplink Port:
  RDEV: E000.P00 VDEV: 0600 Controller: DTCVSW1
        EQID: ABCDEFGH
 Adapter Connections:
    Adapter Owner: REDHAT62 NIC: 0600.P00 Name: UNASSIGNED  Type: QDIO
:
      Device: 0602  Unit: 002   Role: DATA       Port: 0001
      Options: Broadcast Multicast IPv6 IPv4 VLAN
        Unicast IP Addresses:
          10.100.0.103          MAC: 02-00-01-00-00-06
          FE80::200:100:100:6   MAC: 02-00-01-00-00-06 Local
```

Matches names on OSAs on other members

IP

MACID

Network on the air during the relocate



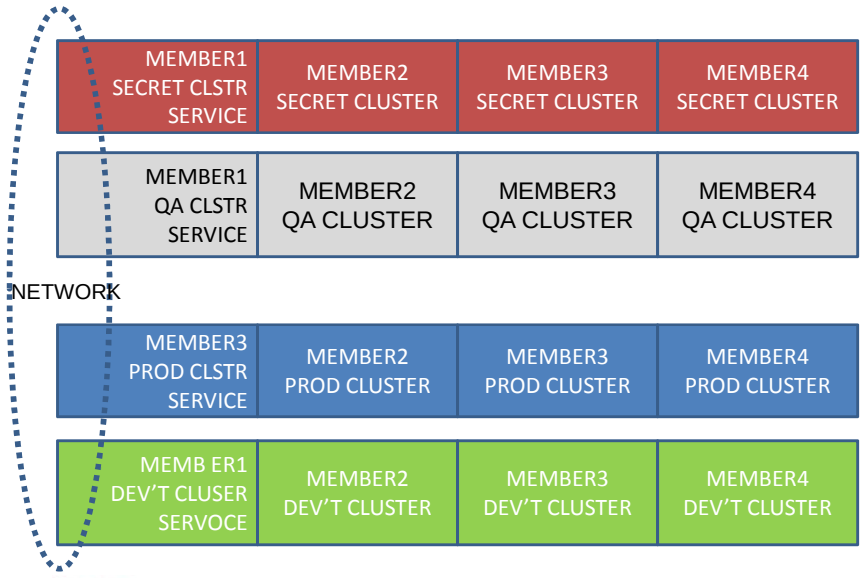
RACF DB's Must be on Full Packs IGNORE

For z/VM SSI installation, you must manually define the primary (virtual address 200) and backup (virtual address 300) RACF databases as two 3390 full-pack minidisks. It is required that the RACF database is shared between the members of an SSI cluster.

Exponential Clustering

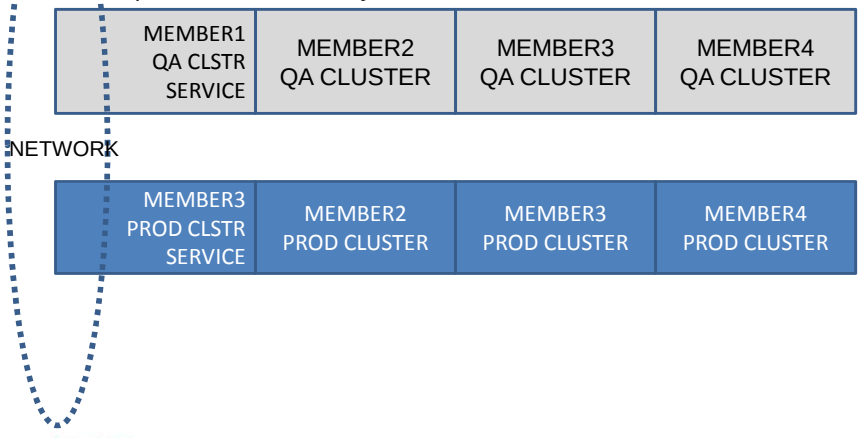
- Designed for a client with extreme security requirements
- Horizontal clusters
- Join multiple clusters together vertically
- Lots of controls available
- Create non-clustered sysadmin service zone.

Horizontal clusters with Vertical Connection



Horizontal clusters with Vertical Connection

The network connects the service zone LPAR in each CLUSTER. Exploits the benefits of RSCS, DIRMAINT, TELNET, FTP, etc. The network is an administration network and does not (should not) carry production data of any sort.



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The PIPEDDR tool

- The PIPEDDR tool copies minidisks over TCPIP.
- What a great tool!
- Available from the IBM VM Download Page: www.vm.ibm.com/download

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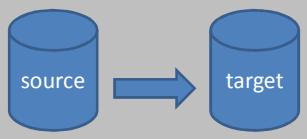
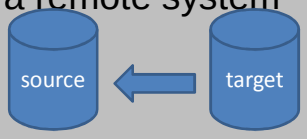
PIPEDDR: DUMP and Restore

- DUMP
  - to a CMS file
  - to a FTP server
  - to an NFS
  - directly to a minidisk on a remote system



- RESTORE
  - from a CMS file
  - from an FTP or HTTP server
  - from an NFS (requires CMS NFS client)



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PIPEDDR Package: The Pieces

- PIPEDDR
  - The main event
- PIPE Runtime Library – required stages for the PIPEDDR
  - *Should use it anyway*
- DRPC:
  - DDR module replacement
  - PIPE DDR stage
- PIPSYSF
  - Extended functions (not strictly required)

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Example of VMARC

```
listfile * vmarc ( date
FILENAME FILETYPE FM FORMAT LRECL       RECS   …
DRPC     VMARC    A1 F         80       1703   …
PIPEDDR  VMARC    A1 F         80        456   …
PIPSYSF  VMARC    A1 F         80       1119   …
RUNTIME1 VMARC    A1 F         80      26444   …

vmarc unpk pipeddr vmarc a
PIPEDDR  EXEC     A2. Bytes in=     21760, bytes out=     62543 (   287%).
PIPEDDR  HELPCMS  A1. Bytes in=     10160, bytes out=     24103 (   237%).
PIPEDDR  MEMO     A1. Bytes in=      4560, bytes out=      8309 (   182%).
Ready; T=0.01/0.01 09:30:55
```

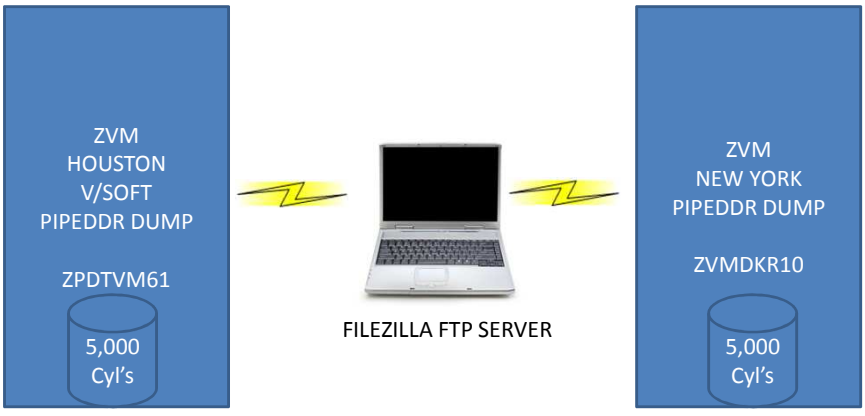

My Usage at Client Sites

- Bulk data transfer of Linux minidisks across LPARs
  - Let TCPIP handle it over hipersocket
  - Use PIPEDDR in LISTEN mode on receiving side
- Bulk data transfer of Linux minidisks across CECs
  - Let TCPIP handle it
  - No worries about geography

Mechanics

- Unpack pertinent archives with VMARC
  - RUNTIME
  - PIPSYSF
  - DRPC
  - PIPEDDR
- Run PIPINIT to pick up runtime version of PIPEs (it's better for you anyway).

Bulk Transfer 5,000 Cylinder Minidisk Containing Linux With Two Partitions



DUMP via FTP on HOUSTON z/VM System

```
q userid
MAINT    AT ZPDTVM61

pipeddr dump redhat62 150 (ftp -h 99.237.168.41 -u pipeddr
-p pipeddr -f RHEL62.DISK0150
Dumping disk REDHAT62 0150 to FTP file RHEL62.DISK0150
Cylinder 133 of 5000 completed (2%)
Cylinder 266 of 5000 completed (5%)
:
Cylinder 4800 of 5000 completed (96%)
Cylinder 4933 of 5000 completed (98%)
Dump completed.
Ready; T=96.47/107.01 17:29:47
```

VM RESOURCES LTD Software * Consulting * Training

File is Tucked Away on Hard Drive

```
10/06/2012  05:41 PM       889,793,536 rhel62.disk0150
```

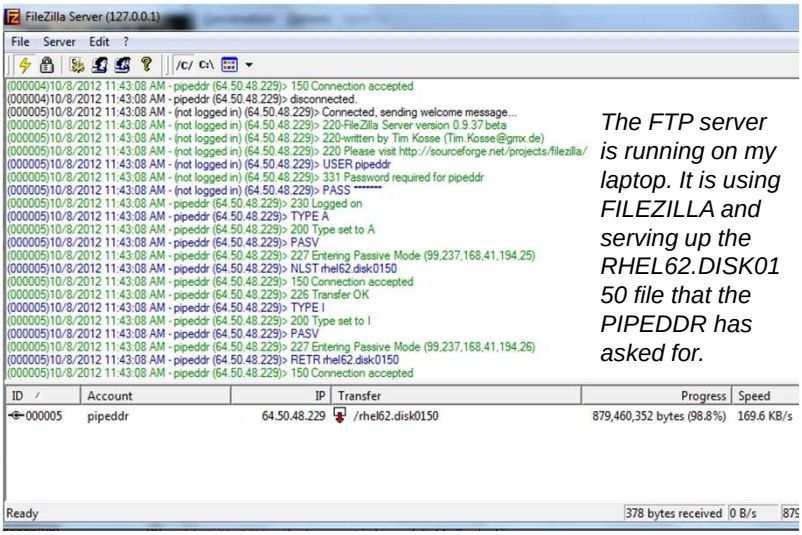
VM RESOURCES LTD Software * Consulting * Training

Restore via FTP on ZVMDKR10 NEW YORK z/VM System

```
q userid ext
MAINT    AT ZVMDKR10

pipeddr restore redhat62 150 (ftp -h 99.237.168.41 -u
pipeddr -p pipeddr -f rhel62.disk0150
Any data on REDHAT62 0150 will be erased.
Continue? (Y/N)
y
rhel62.disk0150
Restoring data to REDHAT62 0150 from FTP file
rhel62.disk0150
Cylinder 133 of 5000 completed (2%)
:
Cylinder 4933 of 5000 completed (98%)
Data restored successfully.
Ready; T=160.82/232.00 12:25:22
```


FTP Server



The FTP server is running on my laptop. It is using FILEZILLA and serving up the RHEL62.DISK0150 file that the PIPEDDR has asked for.

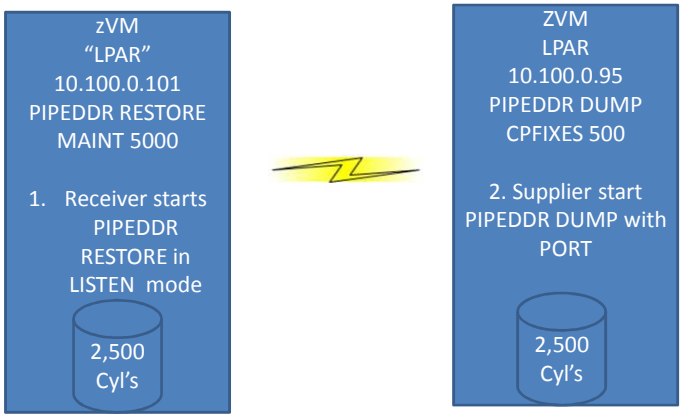
IPL Linux from the Restored 150

```
xautolog redhat62 noipl
Command accepted
Ready; T=0.01/0.01 10:06:59
AUTO LOGON  ***       REDHAT62 USERS = 14
set secuser redhat62 *
HCPCFX6768I SECUSER of REDHAT62 initiated.
HCPQCS150A User REDHAT62 has issued a CP read
Ready; T=0.01/0.01 10:07:04
send cp redhat62 i 150 clear loadparm 0
Ready; T=0.01/0.01 10:07:15
REDHAT62: Booting default (linux-2.6.32-220.el6.s390x)...
REDHAT62: Initializing cgroup subsys cpuset
REDHAT62: Initializing cgroup subsys cpu
REDHAT62: Linux version 2.6.32-220.el6.s390x (mockbuild@s390-001.build.bos.redha
t.com) (gcc version 4.4.5 20110214 (Red Hat 4.4.5-6) (GCC) ) #1 SMP Wed Nov 9 08
:20:08 EST 2011
REDHAT62: setup: Linux is running as a z/VM guest operating system in 64-bit mod
e
REDHAT62: Kernel command line: root=/dev/mapper/vg_rhel62-LogVol00 rd_NO_LUKS LA
NG=en_US.UTF-8 rd_DASD=0.0.0150 ro_DASD=0.0.0300 rd_NO_MD rd_LVM_LV=vg_rhel62/Lo
gVol00  KEYTABLE=us SYSFONT=latarcyrheb-sun16 crashkernel=auto rd_NO_DM BOOT_IMA
GE=0
:
```


The restored disk with two partitions

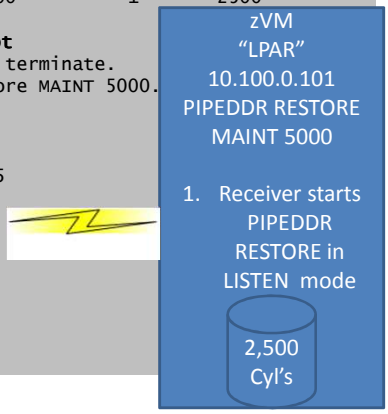
```
:
REDHAT62: dasd-eckd 0.0.0150: New DASD 3390/0C (CU 3990/01) with 5000 cylinders,
 15 heads, 224 sectors
REDHAT62: dasd-eckd 0.0.0150: DASD with 4 KB/block, 3600000 KB total size, 48 KB
/track, compatible disk layout
REDHAT62:  dasda:VOL1/  0X0150: dasda1 dasda2
REDHAT62: dracut: Scanning devices dasda2  for LVM logical volumes vg_rhel62/Log
Vol00
REDHAT62: Red Hat Enterprise Linux Server release 6.2 (Santiago)
REDHAT62: Kernel 2.6.32-220.el6.s390x on an s390x
REDHAT62:
REDHAT62: rhel62 login:
:
```

Bulk Transfer 2,500 Cylinder Minidisk Containing CMS Data (RSUs and PTFs)



Receiver Side Starts First

```
q mdisk userid maint 5000 drct loc
TargetID Tdev OwnerID  Odev Dtype Vol-ID Rdev   StartLoc       Size
MAINT    5000 MAINT    5000 3390  MBR001 5000          1       2500
Ready; T=0.01/0.01 10:43:22
pipeddr restore maint 5000 ( listen noprompt
Connecting to TCP/IP.  Enter PIPMOD STOP to terminate.
Waiting for connection on port 1036 to restore MAINT 5000.
Sending user is MAINT at ZVMDKR10
DMSRXS1408W File TCPIP DATA * not found
DMSRXS1408W File TCPIP DATA * not found
Receiving disk CPFIXES 0500 from 10.100.0.95
Cylinder 133 of 2500 completed (5%)
Cylinder 266 of 2500 completed (10%)
:
Cylinder 2266 of 2500 completed (90%)
Cylinder 2400 of 2500 completed (96%)
529 MB received.
Data restored successfully.
Ready; T=4.32/5.14 10:47:18
```

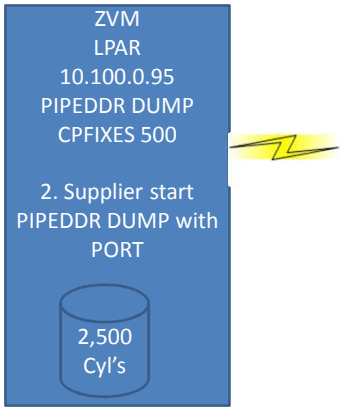


Supply Side Disk Information

```
q mdisk userid cpfixes 500 loc drct
TargetID Tdev OwnerID  Odev Dtype Vol-ID Rdev   StartLoc       Size
CPFIXES  0500 CPFIXES  0500 3390  LK0B54 0B54       6041       2500
q disk x
LABEL  VDEV M  STAT   CYL TYPE BLKSZ   FILES  BLKS USED-(%) …
CPFIXS 121  X   R/O  2500 3390 4096       10     155090-34  …
Ready; T=0.01/0.01 09:39:11
l * * x ( d
FILENAME FILETYPE FM FORMAT LRECL       RECS     BLOCKS   DATE     TIME
S1449727 DOCS     X1 V       8192          6         11 10/07/12 10:45:19
S1449727 SERVLIN  X1 V       4005         79         63 10/07/12 10:51:37
S1449727 SERVLINK X1 V       4005       4989       3875 10/07/12 10:50:24
S1449727 TERSLINK X1 F       1024         41         11 10/07/12 10:51:14
S1449727 TFSS     X1 V       8192        622       1244 10/07/12 10:45:35
S1449728 GOOD-DOC X1 F         80        667         14 10/08/12  9:50:25
S1449728 SERVLINK X1 V       4005      74637      67963 10/08/12 10:16:55
S1449728 SHIPDOC  X1 V       8192          2          3 10/08/12  8:42:54
S1449728 SHIPRSU1 X1 V       8192      21634      40748 10/08/12  9:52:02
S1449728 TERSLINK X1 F       1024     162948      40737 10/08/12 10:15:26
Ready; T=0.01/0.01 09:39:35
```


Supply Side with IP address and listener port specified

```
pipeddr dump cpfixes 500 10.100.0.101 1036
Dumping disk CPFIXES 0500 to 10.100.0.101
Cylinder 133 of 2500 completed (5%)
Cylinder 266 of 2500 completed (10%)
Cylinder 400 of 2500 completed (16%)
Cylinder 533 of 2500 completed (21%)
:
Cylinder 2266 of 2500 completed (90%)
Cylinder 2400 of 2500 completed (96%)
-- All data sent to MAINT AT MEMBERX1 --
529 MB transmitted.
Dumping completed.
Ready; T=8.54/11.20 09:47:18
```



Receiver Side Disk Info – all is good!

```
q disk l
LABEL  VDEV M  STAT   CYL TYPE BLKSZ   FILES  BLKS USED-(%) …
CPFIXS 5000 L   R/W  2500 3390 4096      10     155090-34  …
Ready; T=0.01/0.01 11:01:39
l * * l (d
FILENAME FILETYPE FM FORMAT LRECL       RECS     BLOCKS   DATE     TIME
S1449727 DOCS     L1 V       8192          6         11 10/07/12 10:45:19
S1449727 SERVLIN  L1 V       4005         79         63 10/07/12 10:51:37
S1449727 SERVLINK L1 V       4005       4989       3875 10/07/12 10:50:24
S1449727 TERSLINK L1 F       1024         41         11 10/07/12 10:51:14
S1449727 TFSS     L1 V       8192        622       1244 10/07/12 10:45:35
S1449728 GOOD-DOC L1 F         80        667         14 10/08/12  9:50:25
S1449728 SERVLINK L1 V       4005      74637      67963 10/08/12 10:16:55
S1449728 SHIPDOC  L1 V       8192          2          3 10/08/12  8:42:54
S1449728 SHIPRSU1 L1 V       8192      21634      40748 10/08/12  9:52:02
S1449728 TERSLINK L1 F       1024     162948      40737 10/08/12 10:15:26
Ready; T=0.01/0.01 11:01:43
```